

Final

Site Investigation Report
Ground Scar South of the Autocraft Shop, Parcel 157(7)

Fort McClellan
Calhoun County, Alabama

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Table of Contents

	Page
List of Appendices	iii
List of Tables	iv
List of Figures	iv
Executive Summary	ES-1
1.0 Introduction	1-1
1.1 Project Description	1-1
1.2 Purpose and Objectives	1-2
1.3 Site Description and History	1-2
2.0 Previous Investigations.....	2-1
3.0 Current Site Investigation Activities	3-1
3.1 Environmental Sampling.....	3-1
3.1.1 Surface Soil Sampling.....	3-1
3.1.2 Subsurface Soil Sampling.....	3-1
3.1.3 Well Installation.....	3-2
3.1.4 Water Level Measurements	3-3
3.1.5 Groundwater Sampling	3-3
3.2 Surveying of Sample Locations	3-4
3.3 Analytical Program.....	3-4
3.4 Sample Preservation, Packaging, and Shipping	3-4
3.5 Investigation-Derived Waste Management and Disposal	3-5
3.6 Variances/Nonconformances.....	3-6
3.7 Data Quality	3-6
4.0 Site Characterization	4-1
4.1 Regional and Site Geology.....	4-1
4.1.1 Regional Geology.....	4-1
4.1.2 Site Geology	4-4
4.2 Site Hydrology	4-4
4.2.1 Surface Hydrology.....	4-4
4.2.2 Hydrogeology	4-5

Table of Contents (Continued)_____

	Page
5.0 Summary of Analytical Results.....	5-1
5.1 Surface Soil Analytical Results.....	5-2
5.2 Subsurface Soil Analytical Results.....	5-3
5.3 Groundwater Analytical Results.....	5-4
6.0 Summary, Conclusions, and Recommendations	6-1
7.0 References	7-1
Attachment 1 - List of Abbreviations and Acronyms	

List of Appendices

Appendix A - Sample Collection Logs and Analysis Request/Chain-of-Custody Records

Appendix B - Boring Logs and Well Construction Logs

Appendix C - Well Development Logs

Appendix D - Survey Data

Appendix E - Summary of Validated Analytical Data

Appendix F - Data Validation Summary Reports

Appendix G - Summary Statistics for Background Media, Fort McClellan, Alabama

List of Tables

Table	Title	Follows Page
3-1	Sampling Locations and Rationale	3-1
3-2	Soil Sample Designations and Analytical Parameters	3-1
3-3	Monitoring Well Construction Summary	3-2
3-4	Groundwater Elevations	3-3
3-5	Groundwater Sample Designations and Analytical Parameters	3-3
3-6	Groundwater Field Parameters	3-3
5-1	Surface Soil Analytical Results	5-2
5-2	Subsurface Soil Analytical Results	5-2
5-3	Groundwater Analytical Results	5-2

List of Figures

Figure	Title	Follows Page
1-1	Site Location Map	1-2
1-2	Site Map	1-2
3-1	Sample Location Map	3-1
4-1	Groundwater Elevation Map	4-5

Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK08, IT Corporation (IT) completed a site investigation (SI) at the Ground Scar South of the Autocraft Shop, Parcel 157(7), at Fort McClellan in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site and, if present, whether the concentrations present an unacceptable risk to human health or the environment. The SI at the Ground Scar South of the Autocraft Shop, Parcel 157(7), consisted of the sampling and analysis of six surface soil samples, three subsurface soil samples, and two groundwater samples. In addition, two permanent groundwater monitoring wells were installed in the residuum groundwater zone to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information. As part of this investigation, IT incorporated data previously collected by QST Environmental, Inc. at the Ground Scar South of the Autocraft Shop, Parcel 157(7).

Chemical analyses of samples collected at the Ground Scar South of the Autocraft Shop, Parcel 157(7) indicate that metals, volatile organic compounds (VOC), and semivolatile organic compounds (SVOC) were detected in the various site media. Pesticides, polychlorinated biphenyls and nitroaromatic compounds were not detected in samples collected at the site. To evaluate whether the detected constituents pose a threat to human health and the environment, the analytical results were compared to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for Fort McClellan.

The potential threat to human receptors is expected to be minimal. Although the site is projected for passive recreation reuse, the analytical data were screened against residential human health SSSLs to evaluate the site for possible unrestricted future use. The metals that exceeded SSSLs in site media were below their respective background concentrations or within the range of background values and, thus, do not pose a threat to human health. Polynuclear aromatic hydrocarbons (PAH) compounds were detected in one surface soil sample at concentrations below PAH background values. VOC results in site media were below SSSLs.

The potential threat to ecological receptors is also expected to be very low. The metals that exceeded ESVs were below their respective background concentrations or within the range of background values, with the exceptions of beryllium, copper, and selenium in surface soil. However, beryllium, copper, and selenium are not believed to be site-related metals and are

attributed to variations in naturally occurring background levels. Three PAH compounds were detected in one surface soil sample at concentrations exceeding ESVs, but below PAH background values. VOC results were below ESVs.

Based on the results of the SI, past operations at the Ground Scar South of the Autocraft Shop, Parcel 157(7), do not appear to have adversely impacted the environment. The metals and chemical compounds detected in site media do not pose an unacceptable risk to human health or the environment. Therefore, IT recommends “No Further Action” and unrestricted land reuse at the Ground Scar South of the Autocraft Shop, Parcel 157(7).

1.0 Introduction

The U.S. Army has selected Fort McClellan (FTMC), located in Calhoun County, Alabama, for closure by the Base Realignment and Closure (BRAC) Commission under Public Laws 100-526 and 101-510. The 1990 Base Closure Act, Public Law 101-510, established the process by which U.S. Department of Defense (DOD) installations would be closed or realigned. The BRAC Environmental Restoration Program requires investigation and cleanup of federal properties prior to transfer to the public domain. The U.S. Army is conducting environmental studies of the impact of suspected contaminants at parcels within FTMC under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE contracted IT Corporation (IT) to provide environmental services for completion of the site investigation (SI) at the Ground Scar South of the Autocraft Shop, Parcel 157(7), under Contract Number DACA21-96-D-0018, Task Order CK08.

The U.S. Army Environmental Center (AEC) originally contracted QST Environmental, Inc. (QST) to perform the SI at the Ground Scar South of the Autocraft Shop, Parcel 157(7). QST prepared an SI work plan (QST, 1998) and conducted field activities in May 1998. QST collected soil samples and attempted to install two groundwater monitoring wells using direct-push technology (DPT). However, the DPT boreholes were dry and no groundwater samples were collected. Therefore, the USACE contracted IT to install two permanent groundwater monitoring wells and to collect two groundwater samples.

This SI report summarizes field activities, including field sampling and analysis and monitoring well installation activities, and data compiled by IT and QST for the SI conducted at the Ground Scar South of the Autocraft Shop, Parcel 157(7).

1.1 Project Description

The Ground Scar South of the Autocraft Shop, Parcel 157(7), was identified as an area to be investigated prior to property transfer. The site was classified as a Category 7 site in the environmental baseline survey (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 7 sites are areas that are not evaluated and/or that require further evaluation.

IT performed field work in accordance with the installation-wide sampling and analysis plan (SAP) (IT, 2000a). The SAP, which includes both the installation-wide safety and health plan

and the quality assurance plan, was used as an attachment to the installation-wide work plan (IT, 1998).

The SI field work included the collection and analysis of six surface soil samples (by QST), three subsurface soil samples (by QST), and two groundwater samples (by IT). The analytical results were used to determine if potential site-specific chemicals were present at the Ground Scar South of the Autocraft Shop, Parcel 157(7).

1.2 Purpose and Objectives

The SI program was designed to collect data from site media and provide a level of defensible data and information in sufficient detail to determine whether chemical constituents are present at the Ground Scar South of the Autocraft Shop, Parcel 157(7), at concentrations that present an unacceptable risk to human health or the environment. The conclusions of the SI in Chapter 6.0 are based on the comparison of the analytical results to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for FTMC. The SSSLs and ESVs were developed by IT as part of the human health and ecological risk evaluations associated with SIs being performed under the BRAC Environmental Restoration Program at FTMC. The SSSLs, ESVs, and polynuclear aromatic hydrocarbon (PAH) background screening values, are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). The PAH background screening values were developed by IT at the direction of the BRAC Cleanup Team (BCT) to address the occurrence of PAH compounds in surface soils as a result of anthropogenic activities at FTMC. Background metals screening values are presented in the *Final Background Metals Survey Report, Fort McClellan, Alabama* (Science Applications International Corporation [SAIC], 1998).

Based on the conclusions presented in this SI report, the BCT will decide either to propose “No Further Action” or to conduct additional work at the site.

1.3 Site Description and History

The Ground Scar South of the Autocraft Shop, Parcel 157(7), is located in the west-central portion of the FTMC Main Post, near the intersection of Derby Street (formerly 23rd Avenue) and Justice Avenue (formerly 11th Avenue) (Figures 1-1 and 1-2). The area is bounded on the north by Derby Street and bounded on the south by both Area T-6 and the Former Sandel Flamethrower Range. It is bounded on the east and west by woods.

Aerial photographs taken in 1964 revealed a ground scar that extended south of the Autocraft Shop. Photographs taken in 1954 suggest that soil was excavated from this area. FTMC personnel stated that a “confidence” or obstacle course was located at this site (QST, 1998).

QST personnel identified two borrow pits at the northern edge of the parcel next to Derby Street (QST, 1998). Remnants of the confidence course are located approximately 100 feet south of the borrow pits. Evidence of disposal activities or other activities that could have resulted in environmental damage were not observed (QST, 1998). Additional information regarding operations at this site was not available.

A small hill is located in the eastern half of the parcel. The ground surface along the northern end of the parcel slopes to the north. The moderately sloped site is wooded.

2.0 Previous Investigations

An EBS was conducted by ESE to document current environmental conditions of all FTMC property (ESE, 1998). The study was to identify sites that, based on available information, have no history of contamination and comply with DOD guidance for fast-track cleanup at closing installations. The EBS also provides a baseline picture of FTMC properties by identifying and categorizing the properties by seven criteria:

1. Areas where no storage, release, or disposal of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas)
2. Areas where only release or disposal of petroleum products has occurred
3. Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response
4. Areas where release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment have been taken
5. Areas where release, disposal, and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken
6. Areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented
7. Areas that are not evaluated or require additional evaluation.

The EBS was conducted in accordance with the Community Environmental Response Facilitation Act (CERFA) (CERFA-Public Law 102-426) protocols and DOD policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, the Alabama Department of Environmental Management (ADEM), the U.S. Environmental Protection Agency (EPA) Region IV, and Calhoun County, as well as a database search of Comprehensive Environmental Response, Compensation, and Liability Act-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historical maps and aerial photographs were reviewed to document historical land uses. Personal and telephone interviews of past and present

FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels.

Previous investigations to document site environmental conditions have not been conducted at the Ground Scar South of the Autocraft Shop, Parcel 157(7). Therefore, the site was classified as a Category 7 CERFA site: areas that are not evaluated or require further evaluation.

3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by IT and QST at the Ground Scar South of the Autocraft Shop, Parcel 157(7), including environmental sampling and analysis, and groundwater monitoring well installation activities.

3.1 Environmental Sampling

The environmental sampling performed during the SI at the Ground Scar South of the Autocraft Shop, Parcel 157(7), included the collection of surface soil samples, subsurface soil samples, and groundwater samples for chemical analysis. The sample locations were determined by observing site physical characteristics during a site walkover and by reviewing historical aerial photographs. Environmental samples were collected in the vicinity of the borrow pits to evaluate impacts from potential disposal activities (QST, 1998). The sample locations, media, and rationale are summarized in Table 3-1. Samples collected by IT are designated with the prefix “GSBP-157,” and samples collected by QST are designated with the prefix “SI12.” Sampling locations are shown on Figure 3-1. Samples were submitted for laboratory analysis of site-related parameters listed in Section 3.3.

3.1.1 Surface Soil Sampling

Six surface soil samples were collected by QST during the SI at the Ground Scar South of the Autocraft Shop, Parcel 157(7). Soil sampling locations and rationale are presented in Table 3-1. Sampling locations are shown on Figure 3-1. Sample designations and analytical parameters are listed in Table 3-2. Soil sampling locations were determined in the field by the on-site geologist based on the sampling rationale, presence of surface structures, and site topography.

QST collected six surface soil samples at Parcel 157(7) from 0 to 1 foot below ground surface (bgs) using either a DPT sampling system or a stainless-steel hand auger in accordance with the QST work plan (QST, 1998). The samples were analyzed for parameters listed in Table 3-2 using methods outlined in Section 3.3. Sample collection logs are included in Appendix A.

3.1.2 Subsurface Soil Sampling

QST collected subsurface soil samples from three soil borings at the Ground Scar South of the Autocraft Shop, Parcel 157(7), as shown on Figure 3-1. Subsurface soil sampling locations and rationale are presented in Table 3-1. Subsurface soil sample designations, depths, and analytical parameters are listed in Table 3-2. Soil boring sampling locations were determined in the field

by the on-site geologist based on the sampling rationale, presence of surface structures, and site topography.

QST contracted Graves Service Company, Inc. to complete the soil borings. Subsurface soil samples were collected at a depth of 3 to 4 feet bgs using a DPT sampling system, in accordance with procedures outlined in the QST work plan (QST, 1998).

3.1.3 Well Installation

IT installed two permanent groundwater monitoring wells at the Ground Scar South of the Autocraft Shop, Parcel 157(7), at the locations shown on Figure 3-1. QST attempted to install two temporary groundwater monitoring wells using DPT but reached refusal before encountering groundwater. Table 3-3 summarizes construction details of the wells installed by IT at the Ground Scar South of the Autocraft Shop, Parcel 157(7). The well construction logs are included in Appendix B.

IT Well Installation. IT contracted Miller Drilling, Inc., to install the wells with a hollow-stem auger rig at the locations shown on Figure 3-1. The wells were installed following procedures outlined in Section 4.7 and Appendix C of the SAP (IT, 2000a). The boreholes were advanced with a 4.25-inch inside diameter (ID) hollow-stem auger from ground surface to the first water-bearing zone in residuum. A 2-foot-long, 2-inch ID carbon steel split-spoon sampler was driven at 5-foot intervals to collect residuum for observing and describing lithology. Where split-spoon refusal was encountered, the auger was advanced until the first water-bearing zone was encountered. The on-site geologist constructed a lithological log for each borehole by logging the auger drill cuttings. The drill cuttings were logged to determine lithologic changes and the approximate depth of groundwater encountered during drilling. This information was used to determine the optimal placement of the monitoring well screen interval and to provide site-specific geological and hydrogeologic information. The lithological logs for the boreholes are included in Appendix B.

Upon reaching the target depth in each borehole, a 15-foot-length of 2-inch ID, 0.010-inch continuous slot Schedule 40 polyvinyl chloride (PVC) screen with a 3-inch PVC end cap was placed through the auger to the bottom of the borehole. The screen and end cap were attached to 2-inch ID, flush-threaded Schedule 40 PVC riser. A sand pack consisting of number 1 filter sand (environmentally safe, clean fine sand, sieve size 20 to 40) was tremied around the well screen to approximately 2 feet above the top of the well screen as the augers were removed. The wells were surged using a solid PVC surge block for approximately 10 minutes, or until no more

settling of the filter sand occurred inside the borehole. A bentonite seal, consisting of approximately 2 feet of bentonite pellets, was placed immediately on top of the sand pack and hydrated with potable water. If the bentonite seal was installed below the water table surface, the bentonite pellets were allowed to hydrate in the groundwater. Bentonite seal placement and hydration followed procedures in Appendix C of the SAP (IT, 2000a). The wells were then grouted to ground surface with a bentonite-cement grout. A locking well cap was placed on the PVC well casing. The well surface completion included placing a protective steel casing over the PVC riser and installing a concrete pad around the protective steel casing. Concrete-filled protective steel posts were placed around the well pad.

The wells were developed by surging and pumping with a submersible pump in accordance with methodology outlined in Section 4.8 and Appendix C of the SAP (IT, 2000a). The submersible pump used for well development was moved in an up-and-down fashion to encourage any residual well installation materials to enter the well. These materials were then pumped out of the well in order to re-establish the natural hydraulic flow conditions. Development continued until the water turbidity was equal to or less than 20 nephelometric turbidity units or for a maximum of 8 hours. The well development logs are included in Appendix C.

3.1.4 Water Level Measurements

The depth to groundwater was measured in the permanent wells at the site and in wells at adjacent parcels on March 14, 2000, following procedures outlined in Section 4.18 of the SAP (IT, 2000a). Depth to groundwater was measured with an electronic water level meter. Measurements were referenced to the top of the PVC well casing, as summarized in Table 3-4.

3.1.5 Groundwater Sampling

IT collected groundwater samples from the two permanent monitoring wells installed at the Ground Scar South of the Autocraft Shop, Parcel 157(7). The well locations are shown on Figure 3-1. The groundwater sampling locations and rationale are listed in Table 3-1. The groundwater sample designations and analytical parameters are presented in Table 3-5.

Groundwater sample collection was performed following procedures outlined in Section 4.9.1.4 of the SAP (IT, 2000a). Groundwater was sampled after purging a minimum of three well volumes and after field parameters (temperature, pH, dissolved oxygen, specific conductivity, oxidation-reduction potential, and turbidity) stabilized. Purging and sampling were performed with a submersible pump equipped with Teflon™ tubing. Field parameters were measured using a calibrated water-quality meter. Field parameter readings are summarized in Table 3-6. Sample

collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-5 using methods outlined in Section 3.3.

3.2 Surveying of Sample Locations

IT sample locations were surveyed using global positioning system survey techniques described in Section 4.3 of the SAP and conventional civil survey techniques described in Section 4.19 of the SAP (IT, 2000a). Horizontal coordinates were referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983. Elevations were referenced to the North American Vertical Datum of 1988. Horizontal coordinates and elevations are included in Appendix D.

QST surveyed sample locations using global positioning system survey techniques or traditional surveying techniques described in the QST work plan (QST, 1998). Map coordinates for each sample location were determined using a Transverse Mercator or State Planar grid to within ± 3 feet (± 1 meter). Horizontal coordinates are included in Appendix D.

3.3 Analytical Program

Samples collected during the SI were analyzed for various chemical parameters based on potential site-specific chemicals and on EPA, ADEM, FTMC, and USACE requirements. Target analyses for samples collected at the Ground Scar South of the Autocraft Shop, Parcel 157(7), included:

- Target compound list volatile organic compounds (VOC) – EPA Method 8260B
- Target compound list semivolatile organic compounds (SVOC) – EPA Method 8270C
- Target analyte list metals – EPA Method 6010B/7000
- Total organic carbon (TOC) – EPA Method 9060
- Nitroaromatic explosives – EPA Method 8330
- Pesticides/polychlorinated biphenyls (PCB) – EPA Method 8081A.

The samples were analyzed using EPA SW-846 methods, including Update III Methods where applicable.

3.4 Sample Preservation, Packaging, and Shipping

IT preserved, packaged, and shipped samples following requirements specified in Section 4.13.2 of the SAP (IT, 2000a). Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SI are listed in Table 5-1 of Appendix B of the SAP (IT, 2000a). Sample documentation and chain-of-custody records were completed as specified in Section 4.13

of the SAP (IT, 2000a). Completed analysis request and chain-of-custody records (Appendix A) were secured and included with each shipment of sample coolers to Quanterra Environmental Services in Knoxville, Tennessee.

QST preserved, packaged, and shipped samples following guidelines specified in the QST work plan (QST, 1998).

3.5 Investigation-Derived Waste Management and Disposal

IT Investigation-Derived Waste. IT investigation-derived waste (IDW) was managed and disposed as outlined in Appendix D of the SAP (IT, 2000a). The IDW generated during the SI at the Ground Scar South of the Autocraft Shop, Parcel 157(7), was segregated as follows:

- Drill cuttings
- Purge water from well development and sampling activities and decontamination fluids
- Spent well materials and personal protective equipment.

Solid IDW was stored inside the fenced area surrounding Buildings 335 and 336 in lined roll-off bins prior to characterization and final disposal. Solid IDW was characterized using toxicity characteristic leaching procedure (TCLP) analyses. Based on the results, drill cuttings and personal protective equipment generated during the SI at the Ground Scar South of the Autocraft Shop, Parcel 157(7), were disposed as nonregulated waste at the Industrial Waste Landfill on the Main Post of FTMC.

Liquid IDW was contained in the 20,000-gallon sump associated with the Building T-338 vehicle washrack. Liquid IDW was characterized by VOC, SVOC, and metals analyses. Based on the analyses, liquid IDW was discharged as nonregulated waste to the FTMC wastewater treatment plant on the Main Post.

QST Investigation-Derived Waste. QST-generated IDW was managed and disposed as outlined in the QST work plan (QST, 1998).

3.6 Variances/Nonconformances

Neither IT nor QST documented any variances or nonconformances during completion of the SI at the Ground Scar South of the Autocraft Shop, Parcel 157(7).

3.7 Data Quality

IT Data. The field samples were collected, documented, handled, analyzed, and reported in a manner consistent with the SI work plan (IT, 1998); the FTMC SAP and quality assurance plan; and standard, accepted methods and procedures. As discussed in Section 3.6, there were no variances or nonconformances to impact the usability of the data.

Data were reported and evaluated in accordance with USACE South Atlantic Savannah Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of Appendix B of the SAP [IT, 2000a]). Chemical data were reported via hard-copy data packages by the laboratory using Contract Laboratory Program-like forms. A summary of validated analytical data is included in Appendix E. A complete (100 percent) Level III data validation effort was performed on the reported analytical data. Appendix F includes a data validation summary report that discusses the results of the IT data validation. Selected results were rejected or otherwise qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the report. The validation-assigned qualifiers were added to the FTMC IT Environmental Management System™ (ITEMS) database for tracking and reporting.

QST Data. QST data were submitted to the Installation Restoration Data Management Information System (IRDMIS) database at the conclusion of SI field activities. Hard-copy data packages were sent to the AEC in Edgewood, Maryland, for storage. IT retrieved the electronic data via IRDMIS and the original data packages from the AEC for evaluation. From the IRDMIS data, IT was able to identify the key fields of information and translate the data into the ITEMS database.

QST hard-copy analytical data packages were validated during a complete (100 percent) Level III data validation effort. Appendix F includes a data validation summary report that discusses the results of the QST data validation. Selected results were rejected or qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the data validation report. In addition, during the validation the electronic

results were compared to the hard-copy results. Concentrations in the database were corrected where necessary and validation qualifiers added to the QST data using ITEMS to reflect the findings summarized in the QST data validation report.

After the QST data validation was complete and the results were updated, the QST and IT data were merged using ITEMS for inclusion in this SI report. The combined validated analytical data are presented in tabular form in Appendix E. The validated data were used in the comparisons to the SSSLs and ESVs developed by IT. The IT and QST data presented in this report, except where qualified, meet the principle data quality objective for this SI.

4.0 Site Characterization

Subsurface investigations performed at the Ground Scar South of the Autocraft Shop, Parcel 157(7), provided soil, geologic, and groundwater data used to characterize the geology and hydrogeology of the site.

4.1 Regional and Site Geology

4.1.1 Regional Geology

Calhoun County includes parts of two physiographic provinces, the Piedmont Upland Province and the Valley and Ridge Province. The Piedmont Upland Province occupies the extreme eastern and southeastern portions of the county and is characterized by metamorphosed sedimentary rocks. The generally accepted range in age of these metamorphics is Cambrian to Devonian.

The majority of Calhoun County, including the Main Post of FTMC, lies within the Appalachian fold-and-thrust structural belt (Valley and Ridge Province) where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. The fold-and-thrust belt consists of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted, with major structures and faults striking in a northeast-southwest direction.

Northwestward transport of the Paleozoic rock sequence along the thrust faults has resulted in the imbricate stacking of large slabs of rock referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults, and repetition of lithologic units is common in vertical sequences. Geologic formations within the Valley and Ridge Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992), and vary in age from Lower Cambrian to Pennsylvanian.

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group consists of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984) but in Calhoun County is either undifferentiated or divided into the Cochran and Nichols Formations and an upper, undifferentiated Wilson Ridge and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and conglomerate with interbeds of greenish-gray siltstone and mudstone. Massive to laminated,

greenish-gray and black mudstone makes up the Nichols Formation, with thin interbeds of siltstone and very fine-grained sandstone (Szabo et al., 1988). These two formations are mapped only in the eastern part of the county.

The Wilson Ridge and Weisner Formations are undifferentiated in Calhoun County and consist of both coarse-grained and fine-grained clastics. The coarse-grained facies appears to dominate the unit and consists primarily of coarse-grained, vitreous quartzite, and friable, fine- to coarse-grained, orthoquartzitic sandstone, both of which locally contain conglomerate. The fine-grained facies consists of sandy and micaceous shale and silty, micaceous mudstone, which are locally interbedded with the coarse clastic rocks. The abundance of orthoquartzitic sandstone and quartzite suggests that most of the Chilhowee Group bedrock in the vicinity of FTMC belongs to the Weisner Formation (Osborne and Szabo, 1984).

The Cambrian Shady Dolomite overlies the Weisner Formation northeast, east and southwest of the Main Post and consists of interlayered bluish-gray or pale yellowish-gray sandy dolomitic limestone and siliceous dolomite with coarsely crystalline porous chert (Osborne et al., 1989). A variegated shale and clayey silt have been included within the lower part of the Shady Dolomite (Cloud, 1966). Material similar to this lower shale unit was noted in core holes drilled by the Alabama Geologic Survey on FTMC (Osborne and Szabo, 1984). The character of the Shady Dolomite in the FTMC vicinity and the true assignment of the shale at this stratigraphic interval are still uncertain (Osborne, 1999).

The Rome Formation overlies the Shady Dolomite and locally occurs to the northwest and southeast of the Main Post as mapped by Warman and Causey (1962) and Osborne and Szabo (1984), and immediately to the west of Reilly Airfield (Osborne and Szabo, 1984). The Rome Formation consists of variegated, thinly interbedded grayish-red-purple mudstone, shale, siltstone, and greenish-red and light gray sandstone, with locally occurring limestone and dolomite. The Conasauga Formation overlies the Rome Formation and occurs along anticlinal axes in the northeastern portion of Pelham Range (Warman and Causey, 1962; Osborne and Szabo, 1984) and the northern portion of the Main Post (Osborne et al., 1997). The Conasauga Formation is composed of dark-gray, finely to coarsely crystalline medium- to thick-bedded dolomite with minor shale and chert (Osborne et al., 1989).

Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in

Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone that weather to a chert residuum (Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

The Ordovician Newala and Little Oak Limestones overlie the Knox Group. The Newala Limestone consists of light to dark gray, micritic, thick-bedded limestone with minor dolomite. The Little Oak Limestone is comprised of dark gray, medium- to thick-bedded, fossiliferous, argillaceous to silty limestone with chert nodules. These limestone units are mapped together as undifferentiated at FTMC and other parts of Calhoun County. The Athens Shale overlies the Ordovician limestone units. The Athens Shale consists of dark-gray to black shale and graptolitic shale with localized interbedded dark gray limestone (Osborne et al., 1989). These units occur within an eroded “window” in the uppermost structural thrust sheet at FTMC and underlie much of the developed area of the Main Post.

Other Ordovician-aged bedrock units mapped in Calhoun County include the Greensport Formation, Colvin Mountain Sandstone, and Sequatchie Formation. These units consist of various siltstones, sandstones, shales, dolomites and limestones, and are mapped as one, undifferentiated unit in some areas of Calhoun County. The only Silurian-age sedimentary formation mapped in Calhoun County is the Red Mountain Formation. This unit consists of interbedded red sandstone, siltstone, and shale with greenish-gray to red silty and sandy limestone.

The Devonian Frog Mountain Sandstone consists of sandstone and quartzitic sandstone with shale interbeds, dolomudstone, and glauconitic limestone (Szabo et al., 1988). This unit locally occurs in the western portion of Pelham Range.

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of dark- to light-gray limestone with abundant chert nodules and greenish-gray to grayish-red phosphatic shale, with increasing amounts of calcareous chert toward the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian age, which consists of thin-bedded, fissile brown to black shale with thin intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned

the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, to the Ordovician Athens Shale on the basis of fossil data.

The Jacksonville Thrust Fault is the most significant structural geologic feature in the vicinity of FTMC, both for its role in determining the stratigraphic relationships in the area and for its contribution to regional water supplies. The trace of the fault extends northeastward for approximately 39 miles between Bynum, Alabama and Piedmont, Alabama. The fault is interpreted as a major splay of the Pell City Fault (Osborne and Szabo, 1984). The Ordovician sequence that makes up the Eden thrust sheet is exposed at FTMC through an eroded “window,” or “fenster,” in the overlying thrust sheet. Rocks within the window display complex folding, with the folds being overturned and tight to isoclinal. The carbonates and shales locally exhibit well-developed cleavage (Osborne and Szabo, 1984). The FTMC window is framed on the northwest by the Rome Formation, north by the Conasauga Formation, northeast, east, and southwest by the Shady Dolomite, and southeast and southwest by the Chilhowee Group (Osborne et al., 1997).

4.1.2 Site Geology

The soils mapped at the Ground Scar South of the Autocraft Shop, Parcel 157(7), consist of Montevallo shaly silt loam (MtD3), 10 to 15 percent slopes. The Montevallo series of soils are shallow, well drained, strongly acidic soils that developed in the residuum of interbedded shale and fine-grained sandstone or limestone (U.S. Department of Agriculture, 1961).

The Ground Scar South of the Autocraft Shop, Parcel 157(7), is situated immediately north of a splay of the Jacksonville Fault. Bedrock beneath the site is mapped as Mississippian/Ordovician Floyd and Athens shale, undifferentiated. The area to the south of the site (south of the fault) is underlain by the Cambrian Chilhowee Group.

Based on direct-push and hollow-stem auger boring data collected during the SI, residuum beneath the Ground Scar South of the Autocraft Shop, Parcel 157(7), consists of predominantly silt overlying weathered shale. Competent bedrock was not encountered during drilling.

4.2 Site Hydrology

4.2.1 Surface Hydrology

Precipitation in the form of rainfall averages about 54 inches annually in Anniston, Alabama, with infiltration rates annually exceeding evapotranspiration rates (U.S. Department of

Commerce, 1998). The major surface water features at the Main Post of FTMC include Remount Creek, Cane Creek, and Cave Creek. These waterways flow in a general northwest to westerly direction towards the Coosa River on the western boundary of Calhoun County.

Surface runoff at the Ground Scar South of the Autocraft Shop, Parcel 157(7), follows the general topography and flows radially from the top of a hill in the eastern portion of the parcel. Runoff from the area of investigation flows to the north toward South Branch of Cane Creek, located approximately 200 feet north of the site. Runoff from the southern and western portions of the site is collected in a manmade drainage and carried underneath Fox Road, emptying into South Branch of Cane Creek just east of the parcel.

4.2.2 Hydrogeology

On March 14, 2000, static groundwater levels were measured in the two permanent monitoring wells at the site and in wells at adjacent parcels (Table 3-4). Based on these groundwater elevation data, groundwater flow at the site is predominantly to the north-northeast (Figure 4-1).

During boring and well installation activities, groundwater was encountered in residuum at depths ranging from 16 to 19 feet bgs. Static groundwater levels measured in the monitoring wells (summarized in Table 3-4) were approximately 10 to 15 feet above the depth to water data from the corresponding boring logs. This indicates that the groundwater is under semiconfined conditions.

5.0 Summary of Analytical Results

The results of the chemical analyses of samples collected at the Ground Scar South of the Autocraft Shop, Parcel 157(7), indicate that metals, VOCs, and SVOCs were detected in site media. Pesticides, PCBs, and nitroaromatic explosive compounds were not detected in the samples for which these compounds were analyzed. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC.

Metals concentrations exceeding the SSSLs and ESVs were subsequently compared to metals background screening values to determine if the metals concentrations are within natural background concentrations (SAIC, 1998). Summary statistics for background metals samples collected at FTMC are included in Appendix G. Additionally, PAH concentrations in surface soil that exceeded the SSSLs and ESVs were compared to PAH background screening values. The PAH background screening values were derived from PAH analytical data from 18 parcels at FTMC that were determined to represent anthropogenic activity (IT, 2000b). PAH background screening values were developed for two categories of surface soils: beneath asphalt and adjacent to asphalt. The PAH background screening values for soils adjacent to asphalt are the more conservative (i.e., lower) of the PAH background values and are the values used herein for comparison.

Six compounds were quantified by both SW-846 Method 8260B (as VOC) and Method 8270C (as SVOC), namely 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 1,3-dichlorobenzene, 1,2-dichlorobenzene, hexachlorobutadiene, and naphthalene. Method 8260B yields a reporting limit of 0.005 milligrams per kilogram (mg/kg), while Method 8270C has a reporting limit of 0.330 mg/kg, which is typical for a soil matrix sample. As a result of the direct nature of the Method 8260B analysis and its resulting lower reporting limit, this method should be considered superior to Method 8270C when quantifying low levels (0.005 to 0.330 mg/kg) of these compounds. Method 8270C and its associated methylene chloride extraction step is superior when dealing with samples that contain higher concentrations (greater than 0.330 mg/kg) of these compounds. Therefore, all data were considered; none were categorically excluded. Data

validation qualifiers were helpful in evaluating the usability of data, especially if calibration, blank contamination, precision, or accuracy indicator anomalies were encountered.

The following sections and Tables 5-1 through 5-3 summarize the results of the comparisons of detected constituents to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix E.

5.1 Surface Soil Analytical Results

Six surface soil samples were collected for chemical analysis at the Ground Scar South of the Autocraft Shop, Parcel 157(7). Surface soil samples were collected from the upper 1 foot of soil at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs, ESVs, and background screening values, as presented in Table 5-1.

Metals. Twenty-two metals were detected in the six surface soil samples collected at the Ground Scar South of the Autocraft Shop, Parcel 157(7). Three thallium results were flagged with a “B” data qualifier, signifying that thallium was also detected in an associated laboratory or field blank sample.

The concentrations of aluminum (five locations), arsenic (six locations), and iron (six locations) exceeded SSSLs. With the exception of iron at two locations (SI12-SS02 and SI12-SS06), the concentrations of these metals were below their respective background concentrations. The iron results were within the range of background iron values (Appendix G).

The concentrations of eight metals (aluminum, beryllium, chromium, copper, iron, selenium, vanadium, and zinc) exceeded ESVs. With the exception of beryllium (SI12-SS06), copper (three locations), iron (two locations), selenium (six locations), and zinc (six locations), the concentrations of these metals were below their respective background concentrations. The beryllium result, copper results, and two selenium results exceeded their respective upper background ranges. All other metals results exceeding ESVs were within the range of background (Appendix G).

Volatile Organic Compounds. Five VOCs (2-butanone, acetone, carbon disulfide, toluene, and xylene) were detected in surface soil samples collected at the site. Two acetone results were flagged with a “B” data qualifier, signifying that acetone was also detected in an associated

laboratory or field blank sample. VOC concentrations in the surface soil samples ranged from 0.00053 to 0.26 mg/kg.

VOC concentrations in surface soils were below SSSLs and ESVs.

Semivolatile Organic Compounds. Eleven SVOCs, including ten PAH compounds, were detected in surface soil samples collected at the Ground Scar South of the Autocraft Shop, Parcel 157(7). The bis(2-ethylhexyl)phthalate results were flagged with a “B” data qualifier, signifying that this compound was also detected in an associated laboratory or field blank sample. SVOCs were only detected at two sample locations (SI12-SS05 and SI12-SS06). All eleven SVOCs were detected at SI12-SS05. Bis(2-ethylhexyl)phthalate was the only detected SVOC at SI12-SS06. SVOC concentrations in the surface soil samples ranged from 0.027 to 0.238 mg/kg.

The concentrations of three PAH compounds (benzo[a]pyrene, fluoranthene, and pyrene) exceeded SSSLs and/or ESVs in the sample collected at SI12-SS05. However, these concentrations were below PAH background values.

Total Organic Carbon. One surface soil sample (SI12-SS03) was analyzed for TOC content. The TOC concentration was 11,700 mg/kg, as summarized in Appendix E.

5.2 Subsurface Soil Analytical Results

Three subsurface soil samples were collected for chemical analysis at the Ground Scar South of the Autocraft Shop, Parcel 157(7). Subsurface soil samples were collected a depth of 3 to 4 feet bgs at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background screening values, as presented in Table 5-2.

Metals. Twenty-one metals were detected in subsurface soil samples collected at the Ground Scar South of the Autocraft Shop, Parcel 157(7). The concentrations of three metals (aluminum, arsenic, and iron) exceeded SSSLs, but were below their respective background concentrations.

Volatile Organic Compounds. Five VOCs (acetone, carbon disulfide, ethylbenzene, toluene, and xylene) were detected in subsurface soil samples collected at the Ground Scar South of the Autocraft Shop, Parcel 157(7). One detected concentration of acetone was flagged with a “B” data qualifier, signifying that acetone was also detected in an associated laboratory or field

blank sample. VOC concentrations in the subsurface soil samples ranged from 0.00076 to 0.015 mg/kg.

The VOC concentrations in subsurface soils were below SSSLs.

Semivolatile Organic Compounds. SVOCs were not detected in the subsurface soil samples collected at the Ground Scar South of the Autocraft Shop, Parcel 157(7).

Total Organic Carbon. Two subsurface soil samples (SI12-SS01 and SI12-SS03) were analyzed for TOC content. TOC concentrations in the samples were 7,450 mg/kg and 2,120 mg/kg, as summarized in Appendix E.

5.3 Groundwater Analytical Results

Groundwater samples were collected from two permanent monitoring wells at the Ground Scar South of the Autocraft Shop, Parcel 157(7), at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background screening values, as presented in Table 5-3.

Metals. Twelve metals were detected in the groundwater samples collected at the Ground Scar South of the Autocraft Shop, Parcel 157(7). Iron and manganese were detected at concentrations exceeding SSSLs in both samples. One manganese result (at GSBP-157-MW01) also exceeded its respective background concentration. However, this manganese result (0.669 milligrams per liter [mg/L]) was within the range of background values established by SAIC (1998) (Appendix G).

Volatile Organic Compounds. Chloromethane was detected in both of the groundwater samples collected at the Ground Scar South of the Autocraft Shop, Parcel 157(7). The chloromethane concentrations were below the SSSL.

Semivolatile Organic Compounds. SVOCs were not detected in the groundwater samples collected at the Ground Scar South of the Autocraft Shop, Parcel 157(7).

6.0 Summary, Conclusions, and Recommendations

IT, under contract with the USACE, completed the SI at the Ground Scar South of the Autocraft Shop, Parcel 157(7), at FTMC in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site at concentrations that pose an unacceptable risk to human health or the environment. The SI at the Ground Scar South of the Autocraft Shop, Parcel 157(7), consisted of the sampling and analysis of six surface soil samples, three subsurface soil samples, and two groundwater samples. In addition, two permanent groundwater monitoring wells were installed in the residuum groundwater zone to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information. As part of the investigation, IT incorporated data previously collected by QST at the Ground Scar South of the Autocraft Shop, Parcel 157(7).

Chemical analysis of samples collected at the Ground Scar South of the Autocraft Shop, Parcel 157(7), indicates that metals, VOCs, and SVOCs were detected in site media. Pesticides, PCBs, and nitroaromatic explosive compounds were not detected in samples collected at the site. Analytical results were compared to the SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC. Additionally, metals concentrations exceeding SSSLs and ESVs were compared to media-specific background screening values (SAIC, 1998), and PAH concentrations exceeding SSSLs and ESVs in surface soils were compared to PAH background values (IT, 2000b).

The potential threat to human receptors is expected to be minimal. Although the site is projected for passive recreation reuse, the analytical data were screened against residential human health SSSLs to evaluate the site for possible unrestricted future use. The metals that exceeded SSSLs in site media were below their respective background concentrations or within the range of background values and, thus, do not pose a threat to human health. PAH compounds were detected in one surface soil sample at concentrations below PAH background values. VOC results in site media were below SSSLs.

The potential threat to ecological receptors is also expected to be very low. The metals that exceeded ESVs were below their respective background concentrations or within the range of background values, with the exceptions of beryllium (one sample), copper (three samples) and selenium (two samples) in surface soil. The copper results (43.4 to 47 mg/kg) and selenium

results (1.48 mg/kg and 1.4 mg/kg) were within the same order of magnitude as their respective upper background ranges (24 and 1.3 mg/kg). The beryllium result (1.15 mg/kg) marginally exceeded the upper background range (0.87 mg/kg) and the ESV (1.10 mg/kg) in only one of six surface soil samples. Furthermore, these metals are not believed to be related to the historical operations (i.e., use as borrow areas, obstacle course) conducted at the site. Given the relatively small magnitude of the exceedences and apparent lack of connection to site activities, the elevated concentrations of these metals in surface soil are attributed to variations in naturally occurring background levels. Three PAH compounds were detected in one surface soil sample at concentrations exceeding ESVs, but below PAH background values. VOC results were below ESVs.

Based on the results of the SI, past operations at the Ground Scar South of the Autocraft Shop, Parcel 157(7), do not appear to have adversely impacted the environment. The metals and chemical compounds detected in site media do not pose an unacceptable risk to human health or the environment. Therefore, IT recommends "No Further Action" and unrestricted land reuse at the Ground Scar South of the Autocraft Shop, Parcel 157(7).

7.0 References

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